

BACKGROUND OF THE INVENTION

5 The present invention relates to a communication apparatus which can be connected to ISDN (Integrated Services Digital Network), a method for controlling the same, and a computer-readable storage medium storing a program for the control.

In communication by the use of a terminal (G4 facsimile etc.) connected to an ISDN, a fall-back function has been realized in a conventional facsimile apparatus as an example of such a control method that in a case where a partner apparatus is called with specification of a communication mode (G4•unrestricted digital mode, etc.) in a B-channel thereof, if the communication mode matches, the communication goes on, while if call connection with the ISDN fails due to a mismatch in the communication mode, etc., the communication mode is automatically switched to another mode (G3•3.1-kHz audio mode, etc.) to repeat the procedure.

In the above-mentioned conventional example,
25 however, if call connection with the ISDN fails due to,
for example, a mismatch in communication mode (a case
where the partner is in a G3*3.1-kHz audio mode when it

is called with specification of the G4 non-restricted digital mode, etc.), a fall-back function switches the communication mode into another (G3•3.1-kHz audio mode, etc.) to immediately shift to the call procedure again, so that it may sometimes take too long a time for the partner apparatus, exchanger, or network to be released and thus the partner cannot respond even when called again (i.e., it is in no condition to respond to the calling), whereby the call connection may be impossible even when the communication mode matches.

SUMMARY OF THE INVENTION

In view of the above, it is an object of the present invention to provide a communication apparatus, a method for controlling the same, or a storage medium that enables effective re-calling to a partner terminal, exchanges, or network which takes a long time to be released and that improves a rate of successful connection at the time of re-calling.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing one embodiment of the present invention;

Fig. 2 is a flowchart showing operations of the above-mentioned embodiment;

Fig. 3 is another flowchart showing the operations of the above-mentioned embodiment; and

Fig. 4 gives timer settings of the above-mentioned embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

5 Fig. 1 is a block diagram showing a configuration of a facsimile apparatus related to an embodiment of the present invention.

10 A CPU101 is a system control unit for controlling the apparatus as a whole. A ROM102 stores a control program for controlling the CPU101. The CPU101 and a part of the control program constitute a control means (control step), a decision means (decision step), and a setting means (setting step) in the present invention.

15 A RAM103 consists of an SRAM for storing program control variables, etc. It also stores settings registered by an operator, managing data of the apparatus, and various working buffers.

20 This RAM103 stores also values which are set by a setting means (setting step) for setting a stand-by time in the present invention. The setting means (setting step) may be specifically structured by a method of operator's entry through a keyboard of an operation unit 106 or a method that setting information is transferred from an external apparatus to the
25 present facsimile apparatus via a predetermined interface or network and stored in the RAM103.

A storage memory 104 consists of a DRAM, etc. for

storing image data. A display unit 105 consists of LCDs, LEDs, etc. for notifying a user of the display contents.

5 The operation unit 106 consists of the keyboard, a touch panel, etc. for permitting the operator to enter various information. An image processing unit 107 is used to perform correction processing on image data which is read in and output high-accuracy image data.

10 A scanner 108 consists of a CS image sensor, an original-carrier mechanism, etc. for reading out an original optically to convert it into electrical image data. A recording unit 109 consists of a printer for recording received images or file data on recording paper.

15 A MODEM 110 modulates and demodulates reception/transmission signals in G3 ISDN communication. An ISDN control unit 111 performs transmission control in the D and B channels for ISDN communication via an ISDN communication line 112.

20 Fig. 2 is a flowchart showing one example of the facsimile apparatus related to the present invention.

In Fig. 2, when an operator makes a call via the operation unit 106, the CPU 101 sets an initial communication mode to G4 at S201.

25 Next, at S202, connection is tried in a communication mode set by using a call control procedure in the D channel. At S203, it is decided

whether a D-channel connection procedure has succeeded at S202. When it decides a success at S203, a flow goes to S204 to perform B-channel connection.

At S205, it is decided whether a B-channel
5 connection procedure has succeeded at S204. When it decides a success at S205, communication is conducted at S206 and the flow terminates.

If the decision results in failure at S203 or S205, the flow goes to S207 to perform D-channel
10 termination processing. After the D-channel termination processing is ended (S208), it is decided whether a fall-back should be performed at S209 and S210.

This decision is made to estimate a reason for
15 failure in connection and judge whether the fall-back is effective or not based on a reason such as a mismatch in communication mode.

If, for example, the connection has failed due to a busy state of the partner, the fall-back is not
20 effective. In this case, the fall-back is not performed. If the fall-back has been repeated and any other communication mode is not available, the fall-back is impossible.

Such criterion are specified beforehand by the
25 control program (stored as a program in the ROM102) or specified by the operation unit 106 by selection of a function mode, etc. (i.e., the criterion are input from

the operation unit 106 and stored in the RAM103, thus permitting the CPU101 to decide the fall-back based on the criterion stored in the RAM103), for performing the above-mentioned decisions.

5 If it decides at S210 that the fall-back should not be performed, it is decided at S211 and S212 whether re-dialing should be performed or not.

Specifically, it is here decided whether the number of re-dialing operations has already reached a
10 predetermined value. If it is decided at S212 that re-dialing should not be performed, the communication terminates with a communication error at S213.

 If it is decided at S212 that re-dialing should be performed, the flow shifts to a re-dial stand-by state
15 (S214) and waiting in executed there for a re-dial stand-by time stored in the RAM103 until the time-out (S215). After the time-out, the flow returns to S202 and goes on. For each redialing here, a counter for counting the number of re-dialing operations, move
20 wants by one.

 When it is decided at S210 that the fall-back should be performed, it is decided whether the current communication mode is G4. If it is G4, a re-calling communication mode is set to G3 (transmissibility: 3.1-
25 kHz audio) and, otherwise, G3 (transmissibility: speech), and then the flow goes to S219.

 At S219, a timer (fall-back wait timer) for

waiting for a time lapse stored in the RAM103 is
started. As mentioned above, by operating the
operation unit 106 beforehand, a stand-by time is
stored in the RAM103. When the timer times out, the
5 flow returns to S202 and goes on.

Although the above-mentioned operations are
performed by the CPU101 based on the programs stored in
the ROM102 and the RAM103, according to the present
invention, such programs may be stored on a floppy
10 disk, hard disk, optical disk, magneto-optical disk,
CD-ROM, memory card, or any other external memory
medium, which can be read out by a dedicated read-out
apparatus and taken into a facsimile apparatus to be
executed by the CPU101.

15 Although the above-mentioned embodiment has been
described only with respect to a facsimile apparatus,
the present invention can be applied also to a terminal
that is used in communication of the same purpose as
the above by using as occasion demands a plurality of
20 B-channel protocols in the ISDN.

Although in the above-mentioned embodiment, a
fall-back procedure is performed in an order of G4 to
G3 (transmissibility: 3.1-kHz audio) and then to G3
(transmissibility: speech), the fall-back communication
25 modes and the order are not limited to that embodiment.

Fig. 4 gives setting states of a re-dial timer and
a fall-back timer stored in the RAM103. The re-dial

timer is used at S214 and S215 in Fig. 2, while the
fall-back timer is used at S219 and S220 in Fig. 3.
The re-dial timer can set therein the time of 2 to 10
minutes in units of one minute, while the fall-back
5 timer can set therein the time of zero to 25.5 seconds
in units of 100 ms. These settings may be given, as
mentioned above, by the operator's key-in at the
operation unit 106 or transferred from an external
apparatus to the present facsimile apparatus via a
10 predetermined interface or network and stored in the
RAM103.

As described above, the present invention makes it
possible to provide a timer for stand-by waiting for a
predetermined time before re-calling by the use of a
15 fall-back function, to enable effective re-calling even
to such a partner apparatus, exchanger, or network that
takes a long time in releasing processing, thus
improving a rate of successful connection.